European Regional Science Association
38th European Congress
Vienna, Austria
28 August - 1 September 1998

Aki Kangasharju
Pellervo Economic Research Institute
Eerikinkatu 28, 00180 Helsinki
aki.kangasharju@ptt.fi

REGIONAL VARIATIONS IN FIRM FORMATION: PANEL AND CROSS-SECTIONAL DATA EVIDENCE FROM FINLAND

Abstract

This paper investigates regional variations in firm formation in Finland between 1989 and 1993. Firstly, the paper describes the firm formation process in 19 regions and 88 subregions, and finds that there have been clear variations in firm formation across those areas. Secondly, the paper discusses the regional factors which in the literature have most often been found to affect firm formation at regional levels, and estimates the effects of those factors on firm formation utilising panel data which consists of the Finnish subregions and the five years from 1989 to 1993. Panel data evidence show that the average size of firms in the subregions tends most robustly to explain firm formation in Finland. Thirdly, the paper estimates the effects of those regional factors on firm formation in Finland using cross-sectional data, and compares the results with those obtained by the same method for several European countries and the USA. Cross-sectional results tend to show that demand growth is also an important factor explaining regional firm formation. An additional finding is that cross-sectional results for Finland appear to be similar to those for other countries, whereas panel data results tend to be somewhat different. An implication is that there are substantial variations in entry conditions across the subregions, and that some of the effects of these entry conditions are being captured by so-called "within"-estimator, rather than by the explanatory variables used.

Keywords: firm formation, regions, panel data

1. Introduction

One common long run trend in regional development is has been that production and new jobs tend to concentrate in a few areas. This centripetal development has been rather strong in Finland during the recent decades, and it has been responsible for a certain amount of regionally-uneven development, such as long-term migration out of peripheral, rural and mostly agricultural areas to central areas and southern Finland (see Loikkanen, Laakso and Sullström, 1997 and Niittykangas, 1992). So-called indigenous development, particularly in peripheral and rural areas, is seen as a major process working against this centralisation (see e.g. Kangasharju and Nijkamp, 1998). In indigenous growth, the role of small and new firms is becoming more and more important, as the share of large enterprises in the formation of new employment has been decreasing and the share of small firms increasing (see e.g. Birch, 1979; Reynolds and Maki, 1991; and Barkham, Gudgin, Hart and Hanvey, 1996). Further, recent cuts in the public sector in Finland highlight the importance of indigenous development in noncentral areas, because positive economic development is more sensitive to public-sector cuts in those areas than in central areas with a more diverse economic structure. This paper scrutinises, from regional point of view, one of the most essential ingredients of indigenous development, that is, firm formation.

Regional differences in firm formation have been recently recognised in many countries (see e.g. Reynolds, Storey and Westhead, 1994a for an overview). According to a text book, these differences are due to regional variations in the proportion of small firms and workers with managerial, scientific and technical skills; those in accessibility to finance, small factory units and workshops; and those in the barriers to entry (Armstrong and Taylor, 1993). According to a fairly recent review of empirical results by Reynolds, Storey and Westhead (1994b), in which explanatory characteristics for firm formation were modelled using cross-sectional data, demand growth is the most important process explaining regional firm formation in five European countries and the USA. Further, the presence of small firms and economic specialisation, as well as urbanisation and agglomeration appear to have a consistent positive effect. Personal household wealth (which should ease access to finance) appears to have a weak positive effect; the presence of a liberal political ethos and unemployment have a mixed effect; and local government spending are found to have no statistically significant effect. In addition to studies on the effects of regional characteristics, there is also an emerging literature investigating the possible effects of closure of firms on firm formation (see e.g.

Johnson and Parker, 1994 and 1996; and Kangasharju and Moisio, 1997). This recent issue or net changes in the stock of firms are not studied in this paper, however.

Instead, the primary aim of the present paper is to analyse effects of regional characteristics on firm formation in the Finnish regional context, using variables similar to those reviewed in Reynolds, Storey, and Westhead (1994b); and to compare the results with those obtained for other countries. The paper models regional characteristics affecting regional firm formation utilising five-year panel data comprising 88 subregions[1] (NUTS 4).

NUTS4 -areas form a natural level of investigation, since they have been drawn up on the basis of small economic areas reflecting real commuting and trading areas; and a major proportion of new firms start operating in the market formed by such commuting areas. Further, location and agglomeration benefits (accruing from the presence of firms in the same and inter-linked industries), which contribute to firm formation, are most likely to occur within a common trading and commuting area. The use of panel data instead of pure cross-sectional data is preferable in this context because, firstly, it increases the reliability of estimates, since the number of observations is larger, secondly, it enables the use of more sophisticated models which incorporate less restrictive behavioural assumptions, thirdly, it alleviates multicollinearity, and fourthly, it reduces estimation bias (see e.g. Matyas and Sevestre, 1992).

The period of investigation is 1989-1993. This period includes the occurrence of the worst depression ever in Finland. Tests applied show that the use of panel data during this period suggest that time variance of the coefficients has to be allowed for. This has been done by introducing interaction terms of variables and time dummies into the estimated equations.

The panel data results show that in particular, a lower average size of firms tends to increase firm formation. Using a meta-analytic approach, the paper also compares the panel data results with cross-sectional results for Finland and six other countries. Panel data results appear to differ from cross-sectional results implying subregionally differing entry conditions. In the panel data analysis so-called "within" -estimator appear to capture those entry conditions (so-called fixed-effects) leaving many actual variables insignificant. The cross-sectional results for Finland appear to be rather similar to those obtained for other countries.

This paper is organised as follows. Section 2 explores the pattern of Finnish regional firm formation, section 3 provides the conceptual framework for the econometric analysis, section 4 gives panel data estimation results, section 5 compares both panel data and cross-sectional results for Finland with those obtained for other countries, and section 6 concludes the paper.

2. Spatial Pattern of Firm Formation in Finland

Statistics Finland has compiled data on new firms, as well as on existing enterprises and establishments. At the regional level, data on firm births are freely available from 1989. Until the year 1994 a business enterprise was considered to be a firm on the basis of the amount of turnover tax paid (self-employment) or registration as an employer. Since 1995 Statistics Finland started compiling a new time series on the basis of value added tax. Because data are not available for the whole of 1994, the five years from 1989 to 1993 are available for regional analysis[2].

A quick glance at the data at the national level (national level data is available for a longer period than the regional data) shows that the evolution of the number of founded and operating firms over time reflects the general economic fluctuations in Finland. In the whole country the number of operating firms was about 110,000 at the end of 1984, grew until 1990, and declined over the two subsequent years. By the end of 1993 there were altogether 135,400 firms in Finland. The number of firms founded in a year grew from 16,700 to 22,200 between the years 1986-1989 (See Figure 1). After that point the number of new firms decreased in the two subsequent years. In 1992 the number started increasing again. In 1993 altogether 19,600 firms were founded. The extent of this fluctuation over time has been such that approximately 23 percent more firms were born in 1989 than in the darkest year, 1991, of the following recession.

At the regional level of the 19 Finnish regions (NUTS 3), the largest difference between the best and worst year appeared to be in Satakunta (located in south-western Finland), where 50 percent more firms were born in 1989 than in 1991. The recession affected firm formation the least in Päijät-Häme (located in southern Finland), where only 8 percent more firms were established in 1989 than in 1991. Among the 88 subregions (NUTS 4) these differences are of the same size class as among the regions.

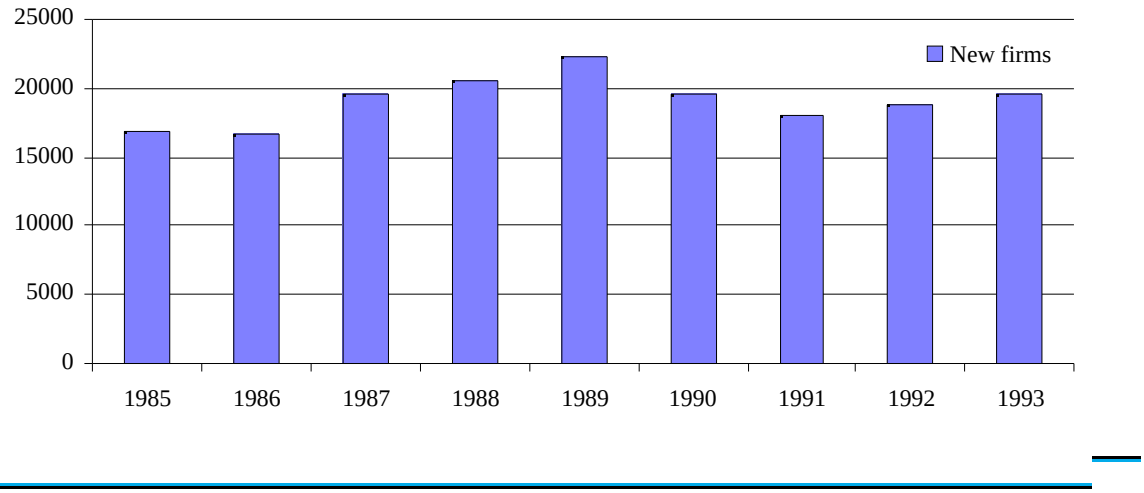

Figure 1. Number of new firms and gross domestic product (in 1990 prices) in Finland. (Source: Statistics Finland.)

To facilitate comparison across the subregions, the present study employed three usually used methods of normalisation of the subregional figures for founded firms. The figures were proportioned to the number of workers in thousands (the labour-market approach), the population in thousands (the population approach) and existing establishments in hundreds (the ecological approach).

In a theoretical sense the labour-market approach is the most appealing, as it is based on the theory of entrepreneurial choice proposed by Evans and Jovanovic (1989). This approach implicitly assumes that entrepreneurs start new firms in the same labour market where they have been accustomed to work, or to look for work. This approach implies that the new entrepreneur has gained some experience as an employee in that labour-market area, and allows that the entrepreneur can have residence in another area (Audretsch and Fritsch, 1994).

A closely related approach to the labour-market one is the population approach in which the number of new firms is considered relative to population. This approach implies that in the overwhelming majority of cases firms in a subregion are founded by individuals living there (see e.g. Cross, 1981, Gudgin, 1978 and O'Farrell, 1986); that firm formation is encouraged principally by the prospects of that market area; and that the potential entrepreneurs living in a subregion form the indigenous potential of the subregion. Normally in the literature these two approaches are treated as alternatives, since they are considered to reflect phenomena so close to each other (Spilling, 1996).

Here the conceptual difference between the approaches is considered as relevant, and therefore both approaches are applied. As the results below will show, there is a clear rationale for using both approaches.

Consideration of the number of new firms per establishments can be termed as the ecological approach, because it considers the flow of firm formation relative to an existing stock (Audretsch and Fritsch, 1994). This approach is based on a view that new firms spin out of existing businesses, which serve as incubators for new firms, and learning arenas for new entrepreneurs (Smith, 1991). A problem with this model is that it overestimates start-up rates in areas dominated by large firms and underestimates them in areas dominated by small firms. This problem is highlighted by the fact that small firms, to a larger extent than bigger firms, usually serve as role models for potential entrepreneurs, as in smaller firms owner-managers are naturally closer to the operating level of the organisation than they are in larger counterparts (Spilling, 1996).

Table 1 shows descriptive statistics on firm formation across the subregions using the three approaches[3]. Like Figure 1, Table 1 shows how the mean of the founded firms across subregions evolved following economic fluctuation. The dispersion of firm formation indicates that there has been clear variation in firm formation in each year. In every year two or three times more firms were founded in the most active subregion than in the least active. One common trend is that in 1993, when the mean of founded firm rose, the ratio between the most and least active subregions also clearly decreased according to each of the three approaches. This evolution implies that the year 1993 was the first clear year of recovery from the recession in terms of firm formation.

Table 1. Descriptive statistics on firm formation by subregions

	Year	Mean	Std. devn	max/min
New firms / 1000 workers	1989	9.852	1.856	178%
	1990	8.800	1.695	174%
	1991	8.770	1.611	170%
	1992	9.356	1.780	155%
	1993	10.24	1.686	137%
New firms / 1000 inhabitants	1989	4.12	0.768	159%
	1990	3.56	0.651	118%
	1991	3.31	0.594	214%
	1992	3.28	0.629	198%
	1993	3.36	0.588	128%
New firms / 100 establishments	1989	13.91	1.708	108%
	1990	11.47	1.693	218%
	1991	11.13	1.639	178%
	1992	11.23	1.877	150%
	1993	12.34	1.849	92%

Figure 2 summarises the regional pattern of firm formation showing the total number of founded firms in 19 regions relative to workers, inhabitants and establishments, respectively, during the whole period. The pattern that emerges shows the Kainuu region to have the lowest figures according to all approaches; while the region of the capital, Helsinki, has the best figures according to the ecological and population approaches, and the Pirkanmaa region has the best figure according to the labour-market approach. According to the population approach, on average of 82 percent more firms were founded in Helsinki than in Kainuu during 1989-1993; and according to the ecological approach, 33 percent. According to the labour-market approach, on average of 46 percent more firms were established in Pirkanmaa than in Kainuu.

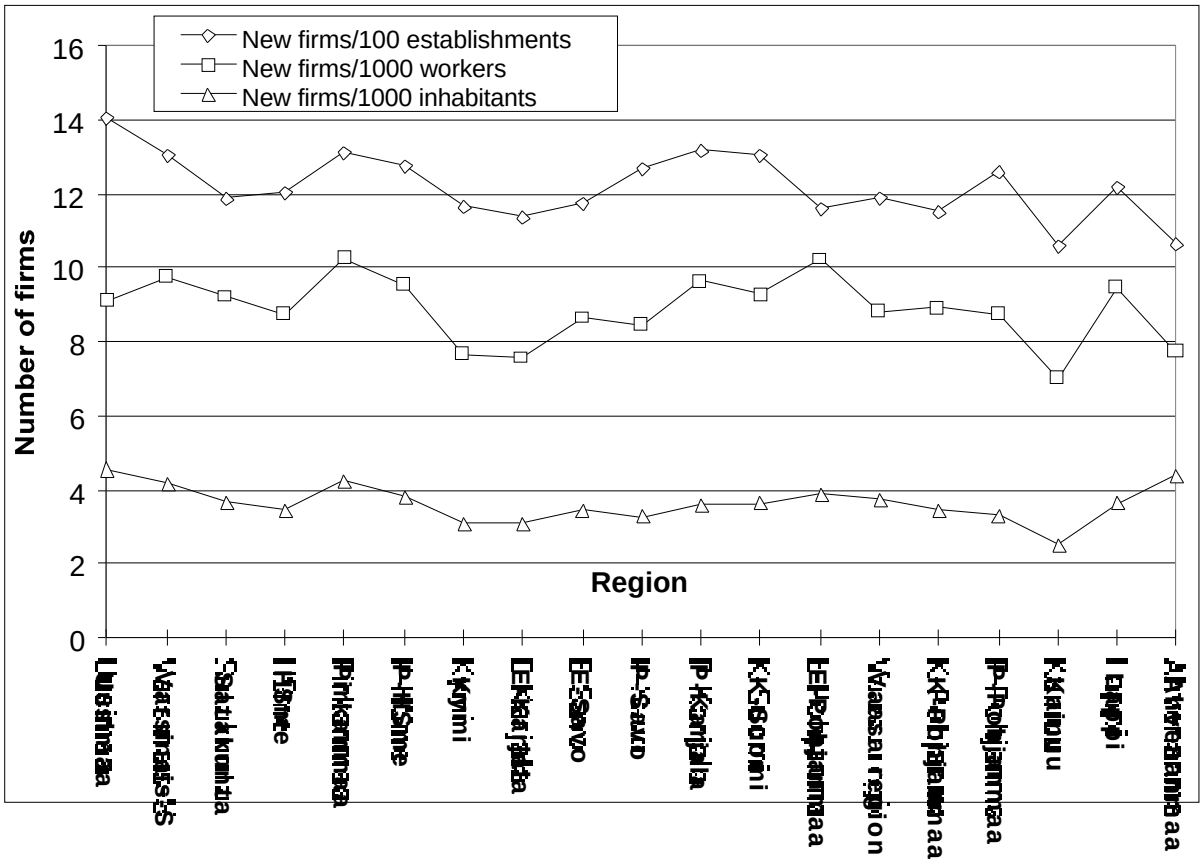

Figure 2. Number of new firms in 19 regions (NUTS3) relative to workers, inhabitants and establishments, 1989-1993.

One interesting region is Ahvenanmaa where the figure for established firms per inhabitants is one of the highest, whereas the figure for new firms per establishments or workers is one of the lowest. This reflects, among other things, the special tax position of the region, which encourages businessmen to register a firm in the region although this may not be where the firm's activities actually take place. To sum up, all these results clearly indicate that there have been regional differences in firm formation in Finland. Let us now turn to the investigation of regional determinants possibly affecting firm formation.

3. Regional Determinants of Firm Formation

This section outlines a conceptual framework for the subsequent regional analysis of firm formation. Consider a model in which each individual or agent in an economy confronts a decision between

wage work and self-employment. Reflecting the human capital approach, we assume that the firm formation at regional level is positively related to the discounted expected utility (e.g. profits) obtained by individuals in a region from self-employment, minus that from wage work (see e.g. Audretsch and Acs, 1993; and Evans and Leighton, 1989). In addition, local characteristics are assumed to determine firm formation at regional level (Blanchflower and Oswald, 1990).

Local characteristics may affect the probability of firm formation through two channels. First, these characteristics may have an impact either upon profits of self-employment or upon utility of wage work, and second, they may have an effect on the probability more directly. The following local characteristics may vary profits between different areas: 1) the local market growth rate, 2) agglomeration and urbanisation effects, 3) entrepreneurial ability, and 4) the actions and 5) political ethos of local government. 6) unemployment is a possible channel through which local characteristics may affect the utility of wage work. Finally, 7) personal or household wealth may affect the probability at regional level, although it does not affect expected utility of self-employment or wage work.

Now, let us take a closer look at these regional factors and the operational variables that this study has used as proxies of those factors. The basic principle in choosing the variables was that they would produce results for Finland comparable to those reviewed by Reynolds, Storey and Westhead (1994b). The means and standard deviations for those variables during the whole period are given in Table A1, and the correlation matrix for those variables is given in Table A2 in the Appendix[4].

1) The market growth rate is usually hypothesised to positively affect the rate of firm formation as it increases demand (see e.g. Davidsson, Lindmark and Olofsson, 1994). Usually market growth is measured by growth of regional per capita GDP and population and by rate of in-migration. In the present study, growth of demand was measured by the growth rate of real subregional per capita GDP (deflated to 1993 year price level) and growth rate of population, denoted hereafter by GRGRP and GRPOP, respectively. A possible objection to the use of GRGRP is that it may be an endogenous variable, in the sense that firm formation may determine GRGRP. It can be argued, however, that firm formation itself need not determine regional income growth, since only the growth of these firms would achieve this. One reason for this is that usually a major proportion of new firms do not grow much, and tend to stop operating within the few first years (see e.g. Storey,

1988). Therefore instead of all new firms, regional per capita income growth is more likely to be determined by a small fraction of those new firms that actually happen to grow.

2) Agglomeration and urbanisation effects refer to those introduced by Marshall (1920) and reinvented by Krugman (1991a, 1991b, and 1991c), and consist of a pooled labour market, the provision of non-traded inputs, and information flows. Those factors are usually more favourable in agglomerations and urban areas than in rural areas. In addition, urban areas usually attract younger, better-educated adults, thereby providing a source of entrepreneurial talent. These effects of agglomerations and urban areas are usually proxied by population density, the proportion of managers in the workforce, and the proportion of highly educated workforce. In the present study agglomeration was measured by population (in thousands) relative to area in square kilometres, denoted hereafter by POPDEN.

3) Entrepreneurial ability in a region depends on both the stochastic distribution of entrepreneurial talent among inhabitants in different regions and on regional-specific factors that enhance the ability. In a regional context, the larger proportion of small firms is often singled out as a factor enhancing entrepreneurial ability (see e.g. Cooper and Dunkelberg, 1986). An explanation for this is that a plethora of small firms provides, among other things, role models and business ideas for potential entrepreneurs, as well as opportunities to familiarise oneself with the market, and with the management of a small business. In other words, small firms are seedbeds where the employees may gain insights into entrepreneurial work that lowers the barriers to founding one's own businesses. Here the presence of small firms was proxied by the average size of establishments (ESIZE), i.e. the number of employees in a subregion relative to establishments.

4) Actions taken by local government, it may be argued, also affect new firm formation. For example, higher local government expenditures may lead to higher taxes and a higher cost structure for all businesses (see e.g. Moisio, 1997). On the other hand, it may increase demand and growth, which have an opposite effect on business sector. These expenditures were proxied here by the operating expenditures of the local government (in thousands) relative to the number of inhabitants (LOCEXP).

5) A conservative right wing majority in local government may result in more generous subsidies or assistance to the small business sector (see e.g. Garofoli, 1994). These effects are usually measured by the proportion of socialist voters, and by proportion of socialists in local parliament. Here, political ethos was measured by the proportion of socialists in local parliament (SOCIALIST)[5].

6) On the one hand, it has been well documented in the labour literature that the wage rate is negatively related to the unemployment rate (see e.g. Tyrväinen, 1995). Therefore an increase in regional unemployment should reduce the utility of wage work at regional level and contribute to firm formation. According to Storey (1991), numerous time-series analyses indicate that unemployment is indeed positively related to new firm formation, whereas cross-sectional or panel data studies appear to indicate the reverse. On the other hand, Tervo and Niittykangas (1994) found some evidence that regional firm formation is negatively related to the level of unemployment, but positively related to the growth of unemployment. The former, it was argued, reflect a lack of business opportunities (lack of market pull), and the latter a weakening of opportunities for paid employment, which pushes entrepreneurially cabable unemployed individuals to self-employment. Here, both unemployment level and the growth rate of the number of unemployed were used as explanatory variables; denoted below by UNRATE and GRUN, respectively.

7) Finally, personal or household wealth is hypothesised to lower financial barriers to firm formation; for example, by offering equity or loans to finance new businesses. In other words, firm formation may be subject to liquidity constraints (Evans and Jovanovic, 1989). On the other hand, this measure may also capture the average living standard of the households. The living standard have possibly been acquired during a long career as a wage-earner, in which case house-ownership tends to decrease the probability for often unsecured self-employment. Personal and household wealth is usually measured by household income, proportion of owner-occupied dwellings, and dwelling prices (see e.g. Hart and Gudgin, 1994). Here it was measured as the proportion of all dwellings in the subregion that were owner-occupied (DWELLING).

4. Panel Data Evidence

Tests of pooling

Although the use of panel data offers immense benefits over cross-sectional data, it may lead to false inferences, if the possible heterogeneity of cross-sectional units or time periods is not taken into account. So before the actual panel data estimations were made, we ran a check to see whether the five separate cross-sections are poolable as such, that is, whether all parameters are invariant over time. The invariance of all parameters across cross-sectional units could be partially tested only.

For testing the time variance of all parameters, the Chow test (according to Chow, 1960) was used. A possible objection to this test is that it may produce a result of no poolability even if the model is in fact poolable, when there is mis-specification or heteroskedasticity in the model. A widely used Reset test for model mis-specification in estimated cross-sectional equations indicated, however, that model mis-specification does not occur in any of the regressions in the labour-market approach, and it occurs only in one regression in the population approach and the ecological approach, when the conventional 0.05 percent level of significance is used (see Tables A3-A5 in the Appendix). In this case, therefore, model mis-specification will account for very little in the Chow test results. The possible effects of heteroskedasticity on the Chow test results have been abolished by using White's heteroskedasticity-consistent covariance matrix estimator in the testing procedure (according to White, 1980).

Table 2 gives the Chow test results (see the Chow test 1 for all approaches) which were computed using the nine explanatory variables described above. F-statistics appeared to be 3.25 for the labour-market approach, 4.03 for the population approach and 3.67 for the ecological approach. In order to avoid type II errors, the hypothesis of poolability was judged at the 0.10 level of significance. The results indicate that the null hypothesis of the time invariance of parameters can be rejected. In other words, parameters do, in fact vary over time in all approaches even if judged at the less strict 0.05 level of significance.

This result is as expected because of the severe period of recession, which apparently changed the relationship between firm formation and subregional characteristics. The effect the result is that one can either turn to an analysis of cross-sectional results for each year, or take the time variance into

account before panel data estimations. The present study preferred the latter alternative, and took time variance into account by introducing the interaction terms of the variables and time dummies into the model[6]. Separate cross-sectional results are shown in the Appendix, and a meta-analytic overview of those results is shown in the next section. The purpose of the interaction terms and time dummies is to capture the changes in the parameters, which take place over time. In fact, this approach is equivalent to postulating a separate regression for each year (Hsiao, 1995). This approach produces more concise results than separate cross-sections, however, since it excludes from the equation all insignificant interaction terms.

Table 2. Tests for panel data specification

Test	**Test value (degrees of freedom)**	**Critical values**
Labour market approach		
Parameter constancy over time (Chow test)	1) F(40, 390)=3.25 2) F (31,390)=1.18	1.32 (the 10% level) 1.36 (the 10% level)
Parameter constancy across subregions (Breusch and Pagan test)	1) - 2) χ^2 (1)=22.37	3.84 (the 5% level)
Random or fixed effects (Hausman specification test)	1) - 2) χ^2 (18)=62.10	28.87 (the 5% level)
Population approach		
Parameter constancy over time	1) F(40,390)=4.03 2) F(33,390)=1.34	1.32 (the 10% level) 1.35 (the 10% level)
Parameter constancy across subregions	1) - 2) χ^2 (1)=91.62	3.84 (the 5% level)
Random or fixed effects	1) - 2) χ^2 (16)=1036.39	26.30 (the 5% level)
Ecological approach		
Parameter constancy over time	1) F(40,390)=3.67 2) F(30,390)=1.03	1.32 (the 10% level) 1.36 (the 10% level)
Parameter constancy across subregions	1) - 2) χ^2 (1)=31.14	3.84 (the 5% level)
Random or fixed effects	1) - 2) χ^2 (19)=150.62	30.14 (the 5% level)

Notes: test 1) includes the 9 variables, and test 2) includes the 9 variable and interaction terms.

Specifically, the estimated equation was obtained by restricting the following general model, which equals to postulating a separate regression for each year:

(1) $$(FF/\Omega_k)_{i,t}=a + bD_t + (c + dD_t)X_{i,t}, \; k=1,3.$$

In other words, this general model allows for all the parameters for one year to differ from those for other years. In the model FF is firm formation and Ω_k is number of workers (in thousands) when k=1, that of population (in thousands) when k=2, and that of establishments (in hundreds) when k=3. D_t denotes time dummies for the years 1989-1992; and $X_{i,t}$ denotes the nine explanatory variables. Parameters are indexed by a, b, c and d, and time periods and subregions are indexed by t and i, respectively.

The selection procedure for the model specification was such that restrictions were added to the model i.e. interaction terms and time dummies were dropped from the model, on the basis of their insignificance[7]. Restrictions were added until the null hypothesis of the Chow test could be rejected at the 0.10 level of significance. In other words, the ultimate specification was the one, which included as many restrictions as possible without the rejection of the null hypothesis. The Chow test result for the specification ultimately obtained is given in Table 2 (see the Chow test 2 for all approaches). As the test statistics for all approaches is less than the 10 percent critical value, the remaining interaction terms have captured the time variance of the parameters. The particular specification of the models is given in Table 3.

When testing the invariance of all parameters across cross-sectional units, the Lagrange multiplier test developed by Breusch and Pagan (1980) was used. Using the specification obtained above, this test produced χ^2 statistics of the size of 22.37 for the labour-market approach, 91.62 for the population approach and 31.14 for the ecological approach, all of which leads to the rejection of the hypothesis of the invariance of all parameters across cross-sectional units. Thus, the estimator must be such that it takes this invariance into account. OLS estimation would in the present case, lead to inconsistent and biased results. As far as the invariance of the slope parameters across cross-sectional units is concerned, this study applies a conventional assumption of invariance. This assumption is made without testing because of the lack of degrees of freedom, which is caused by the lack of years when compared to cross-sectional units. As a consequence, a choice had to be made between fixed effect and random effect estimators, both of which allow variance of the intercept across cross-sectional units.

The choice between random-effect (error component) and fixed-effect (within) models is crucial, as the two estimators may produce different results[8]. Generally speaking, a fixed-effect model produces consistent estimators in the presence of either random or fixed individual effects, whereas a random-effect model produces biased estimators if the individual effects are fixed. In the latter case, the error term is correlated with explanatory variables which lead to biased random-effect results, but consistent fixed-effect results, because in this within-estimation procedure, individual effects are wiped out by subtracting variables from their time-series means (Baltagi, 1995). However, if the effects are random, the random-effect model is the best linear unbiased estimator (BLUE) and is therefore preferable to a fixed-effect model in that case.

Ultimately the choice between fixed and random-effect models is a difficult one, and it has been the focus of wide discussion in the literature (see e.g. Baltagi, 1995; Hsiao, 1995; and Matyas and Sevestre, 1992). On the one hand, the main interest in this study lies in the coefficients and their significance, and much less in the differences between individual units of observation. This refers to the random-effect model. On the other hand, the sample is closed and exhaustive, in the sense that it includes all the geographical areas in Finland. This refers to the fixed-effect model.

Because of the difficulty of the choice, the final choice of estimator was made on the basis of the Hausman specification test (Hausman, 1978). For the labour-market approach the value of χ^2 obtained, with 18 degrees of freedom, was 62.10; for the population approach the test value with 16 degrees of freedom was 1036.39; and for the ecological model the test value with 19 degrees of freedom was 150.62. The degrees of freedom are lowest in the population approach because of the lower number of interaction terms needed there to capture the time variance of the coefficients. As all these values are well above the critical values, the hypothesis of similarity of the coefficients in the fixed and random-effect models could be rejected, which means that error terms are correlated with an explanatory variable, and thus, the nature of the individual effects is fixed.

Results

Table 3 shows the panel data results[9]. The model for the labour-market approach explains 33 percent, and those for the population and ecological approaches, about 45 percent of the variation in

subregional firm formation. All three models are also statistically significant, and a substantial number of interaction terms are needed to capture the time variance of the parameters. The coefficient for GRPOP is the most volatile across the years, as each model needs interaction terms for two years to capture the changes in that variable.

Generally speaking, results show that the average size of establishments (ESIZE) tend to be the most significant regressor; whereas variables proxying demand growth (GRGRP and GRPOP) are, surprisingly, not significant in any model (see Table 3). The results concerning ESIZE are in accordance with the conceptual framework and imply that small firms tend to act as seedbeds for future entrepreneurs. One implication of these results is that firms are not founded so much on the basis of market prospects and demand growth, but rather on the basis of own abilities and business ideas, which have improved when entrepreneurs have been working in other small establishments located in the same subregion. The result that POPDEN is not a significant regressor implies that centripetal regional development in Finland does not manifest itself in subregional rates of new firm formation: firm formation has not been relatively larger in densely than sparsely populated subregions. In all models dummy for the year 1989 is a significant regressor. This implies that in 1989 significantly more firms were established in the subregions than in any other year; reflecting overheating of the Finnish economy in the late 1980s, just before the depression.

Table 3. Regional factors and firm foundation 1989-1993: within estimation

	New firms					
	Labour-market approach		**Population approach**		**Ecological approach**	
	Coef.	**Std.err.**	**Coef.**	**Std.err.**	**Coef.**	**Std.err.**
GRGRP	-1.815	1.110	-0.217	0.397	-1.283	1.334
GRPOP	0.038	2.920	-1.623	1.049	-0.030	3.511
That in 1990	9.301	22.876	4.231	8.202	19.480	27.47
That in 1991	25.510	21.974	10.831	8.089	31.998	26.88
POPDEN	56.177	41.966	-10.294	15.08	73.827	50.77
that in 1991	-3.856	3.443	-	-	-7.423	4.239*
ESIZE	-0.609	0.153***	-0.252	0.052***	0.335	0.191*
that in 1989	-0.182	0.0819*	-	-	-0.434	0.109***
that in 1990	-	-	-	-	-0.308	0.090***
that in 1991	-	-	0.046	0.033	-	-
LOCEXP	-0.190	0.109*	-0.075	0.032**	-0.160	0.134
that in 1991	-	-	-0.032	0.022	-	-
that in 1992	-	-	-	-	-0.031	0.0177*
SOCIALIST	-0.075	3.835	-0.923	1.428	1.792	4.744
that in 1991	-	-	-1.634	0.514***	-6.474	1.672***
that in 1992	3.920	1.349***	-	-	-	-
UNRATE	14.836	7.913*	-8.500	2.057***	17.644	12.06
that in 1991	-	-	13.328	5.528**	34.646	13.94**
that in 1992	-21.89	6.830***	-	-	-	-
GRUN	0.0860	0.324	-0.008	0.098	0.551	0.386
that in 1990	-1.135	1.467	-	-	-	-
DWELLING	-8.487	10.722	-6.214	3.311*	-0.092	13.31
that in 1990	0.651	0.618	-	-	5.612	1.634
Dummy1989	4.490	1.290***	0.635	0.106***	8.342	1.634***
Constant	24.903	9.030***	13.878	2.67***	7.238	11.22
Observations	440		440		440	
F (Df)	F(18,334)=9.18***		F(16,336)=17.31***		F(19,333)=14.63***	
R^2, %	33		45		45	

Notes: *** denotes significance at the 0.01 level
** denotes significance at the 0.05 level
* denotes significance at the 0.10 level

In **the labour-market approach**, among the nine regressors for all five years in the panel, particularly the size of establishments (ESIZE), but also expenditures of local governments (LOCEXP) and the level of unemployment (UNRATE), appear to explain firm formation. ESIZE is the most significant regressor. The average size of establishments across subregions was 13 employees during 1989-1993. The effect of the variable on firm formation is such that a standard error decrease in the average size of establishments, i.e. 1.9 employees less per establishment, tends to lead to 1.2 new firms per thousand workers in the subregions. At the 0.10 level of significance the results also imply that the effect is even somewhat stronger in 1989, 1.5 firms per thousand

workers. The effects of LOCEXP and UNRATE on firm formation are clearly lower than that of ESIZE, and they are significant only at the 10 percent level[10].

In **the population approach**, new firms relative to the inhabitants are significantly explained by ESIZE, DWELLING, LOCEXP and UNRATE. Similarly to the labour-market model, also this model tends to show that a higher small firm dominance in a subregion encourages firm formation. In particular, one standard deviation decrease in average firm size tends to increase firm formation by 0.5 new firms in a year relative to one thousand inhabitants. Further, this effect on firm formation is larger than the effects of other significant regressors in this approach. A standard deviation change in DWELLING, LOCEXP and UNRATE leads to a change in firm formation of about 0.25 new firms per thousand inhabitants.

The population model also seems to indicate that a higher rate of unemployment discourages firm formation. The unemployment variable has a positive sign in 1991 only, as the coefficient for that year (13.3) is greater than that for all years (-8.5). This finding of a negative relation accords with the panel data findings of Storey (1991) and Tervo and Niittykangas (1994).

The model also indicates that a higher share of owner-occupied dwellings (DWELLING) and higher operating costs of local government (LOCEXP) tend to decrease firm formation. One plausible interpretation of the former variable, which is significant only at the 10 percent level, is that a higher share of owner-occupied dwellings indicates a prosperous workforce in the subregions, who have already acquired their own houses and do not personally consider firm foundation. Thus, at least in this analysis of the Finnish regional data this variable does not capture the hypothesised effect of liquidity constraints on firm formation. The negative sign of the latter variable (LOCEXP) implies that higher spending of local government tends to raise the local tax rate and overall cost structure for all businesses.

Concerning **the ecological approach**, the number of significant variables among the nine regressors is very low. Despite this, the explanatory power of the model is quite high, 45 percent, which comes, to a large extent, from the fact that the "within"-estimation allows subregionally varying intercepts, and not so much from the explanatory variables used. This implies that there are substantial variations in the entry conditions across the subregions, and that the effects of these

subregionally varying entry conditions (fixed-effects) are being captured by the "within"-estimator. Different sectoral composition of industries in the subregions is one major candidate inducing these differing entry conditions.

It appears that firm formation per establishment is explained only by ESIZE, and even this variable is significant only at the 10 percent level. To recall, in the labour-market and population model ESIZE appeared to be highly significant regressor. This implies that the dominance of the small firm sector encourages particularly those individuals for firm formation that are living or working in the subregion. This tend to imply that small firms act more as an example and role models for population or workers of a subregion than as a source of business idea for the existing employees of the firms. The effect of small firm dominance on firm formation that stems from existing stock of establishments is in fact ambiguous.

In contrast to the result obtained in the other two approaches, the sign of ESIZE in the ecological approach tends to be against the conceptual framework, as it shows some marginal evidence that a higher number of employees per establishment would increase firm formation. Although the positive sign is against the conceptual framework, cross-sectional results here (see Table A5 in the Appendix) and in some other studies (Davidsson, Lindmark and Olofsson, 1994; and Keeble and Walker, 1994) also had the same sign for a rather similar variable.

An attempt was made to resolve this uncomfortable result by introducing another proxy for the average size of establishments. That variable is the number of establishments relative to population in a subregion. This variable receives a higher value in subregions where the dominance of small establishments is higher. Estimation produced a significant and positive coefficient only for the interaction term of this variable the dummy for the year 1989. This implies that in 1989 a smaller size of establishments increased firm formation. Thus, the use of this optional variable negated the result that in all years the smaller size of establishments would decrease firm formation per establishment[11].

5. International Comparison: A Meta-Analytic Approach

Table 4 presents an overview of the panel data results obtained above, together with cross-sectional results for seven countries. The use of similar explanatory variables facilitates a comparison. The column labelled ‘6 countries’ shows an overview of cross-sectional results for the UK, the USA, France, Germany, Italy and Sweden reviewed by Reynolds, Storey and Westhead (1994b). The column ‘FIN 5’ comprises an overview of the results obtained from five separate cross-sectional regressions for Finland. The separate year-regressions are given in Tables A3-A5 in the Appendix. The column ‘FIN panel’ gives an overview of the panel data results for Finland. All entries in Table 4 include the common sign of the coefficients in different studies ('6 countries') or in different years (‘FIN 5’ and ‘FIN panel’). If the coefficient has the same sign in all cases where it is significant, then the sign and the total number of such cases is given. The term +/- denotes mixed evidence (i.e. there are significant coefficients which are of the opposing signs); and 0 denotes the situation where no coefficient was significant at the 10% level.

In the labour-market and population approach, the variable proxying the average size of firms is most often significant and a positive regressor in all cases ('6 countries', 'FIN 5' and 'FIN panel'). In other words, the overall result for Finland and many other countries is that the presence of small firms is the most important regional determinant of firm formation per labour force or population. The cross-sectional results ('6 countries' and 'Fin 5') show that population growth/in-migration and density of population are often significant regressors too, whereas the panel data results for Finland tend to show that those variables are not significant.

The finding that GRPOP is positively associated with firm formation in cross-sectional studies, whereas unemployment is not, tends to suggest that firm formation is more determined by „pull“ than „push“ factors. Market growth seems to encourage firm formation more than unemployment or fear of it seems to push potential entrepreneurs to own firm foundation. The finding that GRPOP is more robust regressor than GRGRP supports the argument that most of the new firms are oriented to local markets. This means that firms are founded more on the basis of the number of potential clients in the local market than on the basis of growth of local production. This implication is

particularly plausible when the effects of the growth of production leak outside inducing firm formation outside the subregion.

In the ecological approach the results are slightly different, as population growth/in-migration tends to be a significant and positive regressor most often in cross-sectional studies. Population density and the level of unemployment also tend to contribute to firm formation in cross-sectional analyses. In contrast with the labour-market and population approaches, the evidence concerning the presence of small firms tends to be mixed or of the wrong sign both in cross-sectional and panel data cases.

Table 4. Regional factors and firm foundation: review and summary

	Labour-market approach			**Population Approach**		**Ecological approach**		
Independent Variables	**6 countries**	**FIN 5**	**FIN panel**	**FIN 5**	**FIN Panel**	**6 countries**	**FIN 5**	**FIN panel**
Demand growth								
Growth in GDP per capita	+/-	-1	0	0	0	+ 3	- 1	0
In-migration/popul. growth	+ 5	+3	0	+ 3	0	+ 5	+ 3	0
Urbanization/Agglomeration Population density	+ 3	+1	0	+ 5	0	+ 2	+ 2	- 1
Small firms								
Proportion of small firms/ Size of establishments	+ 5	+5	+5	+ 5	+ 5	+/-	- 2	+/-
Government spending								
Local government exp.	- 1	-1	-5	0	- 5	- 1	- 1	- 1
Political ethos								
Socialist voters	+/-	+/-	+1	+/-	- 1	+ 1	+/-	- 1
Unemployment								
Unemployment level	+/-	+2	+/-	+/-	+/-	+ 3	+ 2	+ 1
Change in unemployment	+/-	+2	0	+ 1	0	+/-	+ 1	0
Personal/household wealth								
Owner-occupied dwellings,%	- 2	0	0	- 4	- 5	+/-	+ 1	0

Note: 6 countries means the 6 country studies reviewed by Reynolds, Storey and Westhead (1994), 'Fin 5' means five separate cross-sectional regressions and 'Fin (panel)' means the fixed-effect panel data model. All entries include the common sign of the coefficients in different studies (6 countries) or in different years. If the coefficient is of the same sign in all cases where it is significant, the sign and the total number of such cases is given. Term +/- denotes mixed evidence (i.e. there are significant coefficients which are of opposing signs), and 0 denotes the situation where no coefficient was significant at the 10% level.

A point in common among all the approaches is that in the panel data analysis there are less significant regressors than in the cross-sectional analyses. This implies that there are substantial variations in entry conditions across subregions, and that some of the effects of these entry conditions are being captured by "within"-estimator, rather than by the explanatory variables used. An overall view of all approaches also indicate that the effect of a high level of unemployment is to increase rather than decrease firm formation, a result which is the opposite of that found by Tervo

and Niittykangas (1994). Panel data results using population approach produced an exception to this overall result. The Finnish results according to all approaches show some weak evidence that growth of unemployment may be positively associated with firm formation, as argued by Tervo and Niittykangas (1994). Evidence from the other countries is mixed.

6. Conclusion

The primary aim of this study was to explore regional variations in firm formation in Finland, and to model the effects of regional characteristics on firm formation between 1989-1993. The results show that there are clear variations in firm formation in Finland: in 1989 about 23 percent more firms were founded than in the darkest year, 1991, of the recession, and during 1989-1993 about 82 percent more firms per inhabitant were founded on average in the most active region than in the least active. The difference was 33 percent more on average when the new firms were considered as a proportion of existing firms; and it was 46 percent on average, when the new firms were considered relative to the workforce.

The modelling results obtained using panel and cross-sectional data indicated that in the Finnish context the average size of firms is the most important variable explaining firm formation relative to workers or population; a result which has also been obtained elsewhere (see e.g. Fritsch, 1992; and Armstrong and Taylor, 1993). This result implies that entrepreneurs do not make active location decisions, but rather establish businesses in their living or working environment where they have developed their abilities and business ideas.

As a regional policy implication, this result calls for the establishment of culture and tradition favourable to self-employment, especially in problem areas. In other words, the support of indigenous development needs long-term projects, during which such culture and tradition has time to take root in the desired areas. But another result, which shows that population growth (proxying demand growth) tends to be a robust regressor, limits the possibilities of policy makers to help problem areas. Local demand sets limits for development, especially for those small and medium-sized businesses operating in local markets.

Acknowledgements

This study was part of a research project funded by the Academy of Finland. I would like to thank Antti Moisio, Heikki A. Loikkanen, Hannu Tervo and Jaakko Pehkonen for valuable discussions and comments.

Notes

[1] The 88 subregions are parts of 19 regions (NUTS3) which are themselves parts of the 6 Finnish major regions (NUTS2). In 1993 the average population of the subregions was 57 500 inhabitants; ranging from 2,407 to 1,038,851.

[2] A problem, which arises with the data used, is that a change in the ownership or legal status of a firm means a new firm is recorded in the register. Further, a renewal in the system of turnover tax affected the number of firm registrations in 1991. Because of this renewal, about 4,500 additional firms were subjected to turnover tax. The effects of this change on the total number of firm formations in 1991 have been nullified in the data used.

[3] Descriptive statistics over all years is given in Tables A1 and A2 in the Appendix.

[4] The means, standard deviations and correlation matrices for the variables for each year separately are available upon request.

[5] The period of investigation contained one election year. In other words the SOCIALIST variable can be used, because the value of the variable changes during the period.

[6] Alternative means to get the test of poolability passed are to decrease the number of pooled years, use second-power terms of the variables to capture possible functional mis-specification, and dropping out of variables that have the most volatile estimates over the years considered. The present study also tried these possibilities, and found that if interaction terms are not used, the null hypothesis in the test of poolability is accepted, when the years 1992 and 1993 are discarded from the analysis. As this dramatically reduces the number of observations, and as the results using only the years 1989-1991 are rather similar to those reported in Table 3, those results are not given here. Inclusion of the second-power term, and exclusion of some variables did not help anymore to pass the Chow test.

[7] The restriction of the models on the basis of the extent to which the interaction terms differed from the parameter values for the initial variables for all years together yielded rather similar, but less parsimonious models.

[8] In this data set the results appeared to be clearly different from each other.

[9] These models consist of current period variables. One might think that the variables used here would affect firm formation later than during the corresponding period. Regressions were also run using lagged values of the variables. The results are not reported here, because the overall explanatory power of those variables turned out to be clearly weaker than that of current period variables.

[10] A standard deviation increase in LOCEXP decreases, and that in UNRATE increases firm formation by about 0.5 new firms per thousand workers.

[11] In addition, the panel data results obtained using the years 1989-1991 only, produced an expected sign for the initial variable of employees per establishment.

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Appendix

Table A1. Summary statistics for the variables over the subregions and the years

Name	Abbreviation	Mean	Std. devn.
New firms/1000 workers	FFW	9.40379	1.82383
New firms/1000 inhabitants	FFP	3.52526	0.72068
New firms/100 establishments	FFE	12.01441	2.04298
Growth rate of gross regional product	GRGRP	-0.02087	0.07620
Growth rate of population	GRPOP	0.00103	0.02544
1000 inhabitants/square kilometre	POPDENS	0.02669	0.05046
Workers/establishments	ESIZE	12.96731	1.92431
FIM 1000 operating expenditures of local Government/inhabitants	LOCEXP	21.22130	2.70298
Proportion of socialists in local parliament	SOCIALIST	0.34699	0.11975
Unemployed/inhabitants	UNRATE	0.05194	0.03064
Growth rate of unemployed	GRUN	0.35411	0.48860
Proportion of owner occupied dwellings	DWELLING	0.74407	0.04059

Table A2. Correlation matrix of endogenous and exogenous variables, all years

Variable	X)	Y)	Z)	1)	2)	3)	4)	5)	6)	7)	8)
X) FFW	1.00										
Y) FFP	0	1.00									
Z) FFE	0.65	0	1.00								
1) GRGRP	7	0.73	0	1.000							
2) GRPOP	0.66	1	0.29	-.019	1.000						
3) POPDEN	5	0.25	2	-.010	0.068	1.000					
4) ESIZE	0.06	0	0.11	0.236	0.052	0.300	1.000				
5) LOCEXP	9	0.09	3	-.361	-.042	0.236	0.094	1.000			
6) SOCIALIST	0.06	2	0.21	-.012	-.038	0.218	0.338	0.311	1.000		
7) UNRATE	1	0.28	3	-.261	-.064	-.057	-.301	0.426	0.243	1.000	
8) GRUN	-.048	2	0.28	-.613	0.023	0.150	-.248	0.342	0.021	0.249	1.000
9)	-.513	-.009	2	-.032	-.018	-.393	-.390	-.345	-.389	-.189	-.0020
DWELLING	-.251	-.251	-.193								
	-.150	-.063	0.12								
	0.15	-.316	3								
	5	-.213	-.085								
	-.066	-.148	-.288								
	0.14		-.170								
	5										

Table A3. Regional factors and firm foundation per worker: cross-sectional results for the years 1989-1993.

	1989 Coef. (std.err.)	1990 Coef. (std.err.)	1991 Coef. (std.err.)	1992 Coef. (std.err.)	1993 Coef. (std.err.)
Demand growth					
GRGRP	2.115	0.644	0.744	-8.235	-2.053
	(2.331)	(2.593)	(3.563)	(3.723)**	(2.581)
GRPOP	42.64	75.72	70.00	3.512	-87.65
	(21.59)*	(23.39)***	(21.30)***	(2.945)	(108.7)
Urbanization/Agglomeration					
POPDEN	4.805	4.478	-2.126	5.566	6.854
	(3.355)	(3.524)	(4.158)	(3.852)	(3.165)**
Small firms					
ESIZE	-8.342	-0.620	-0.433	-0.580	-0.658
	(0.085)***	(0.094)***	(0.099)***	(0.138)***	(0.104)***
Government spending					
LOCEXP	0.0122	0.008	-0.038	-0.181	-0.038
	(0.103)	(0.094)	(0.085)	(0.103)*	(0.096)
Political ethos					
SOCIALIST	1.448	1.510	-3.409	4.834	0.885
	(1.414)	(1.345)	(1.421)**	(1.803)***	(1.590)
Unemployment					
UNRATE	14.42	10.47	51.88	-0.935	25.07
	(22.93)	(21.92)	(15.16)***	(13.62)	(11.78)**
GRUN	-0.085	-0.214	0.814	0.011	4.448
	(1.568)	(1.529)	(0.466)*	(1.150)	(1.701)**
Personal/household wealth					
DWELLING	-1.867	7.677	1.856	-3.836	1.276
	(4.823)	(4.837)	(4.655)	(5.878)	(4.923)
Constant	21.82	10.03	11.80	21.11	13.85
	(4.788)***	(4.888)***	(4.915)**	(6.460)***	(5.274)***
Number of regions	88	88	88	88	88
R^2, %	60	51	49	38	45
Adjusted R^2, %	55	45	43	31	39
F(9,78)	13.00***	9.00***	8.31***	5.28***	7.14***
Diagnostic tests					
Normality, $\chi^2(2)$	0.21	1.42	0.58	0.01	1.55
Reset, F(3,75)	0.86	0.09	0.69	0.73	0.76
Heteroscedasticity, $\chi^2(1)$	4.80**	19.94***	1.48	2.62	0.17

Notes: *** denotes significance at the 0.01 level
** denotes significance at the 0.05 level
* denotes significance at the 0.10 level

Table A4. Regional factors and firm foundation per inhabitant: cross-sectional results for the years 1989-1993.

	1989 Coef. (std.err.)	1990 Coef. (std.err.)	1991 Coef. (std.err.)	1992 Coef. (std.err.)	1993 Coef. (std.err.)
Demand growth					
GRGRP	0.135	-0.232	-0.107	-1.508	0.265
	(1.176)	(1.136)	(1.534)	(1.329)	(0.872)
GRPOP	18.77	27.57	24.35	1.296	-45.25
	(10.89)*	(10.25)***	(9.171)***	(1.051)	(36.73)
Urbanization/Agglomeration					
POPDEN	5.138	4.490	1.761	4.088	4.173
	(1.693)***	(0.002)***	(1.791)	(1.375)***	(1.069)***
Small firms					
ESIZE	-0.264	-1.178	-0.090	-0.172	-0.128
	(0.043)***	(0.041)***	(0.043)**	(0.049)***	(0.035)***
Government spending					
LOCEXP	0.001	0.0001	-0.033	-0.021	0.008
	(0.052)	(0.041)	(0.037)	(0.037)	(0.032)
Political ethos					
SOCIALIST	0.580	0.096	-1.674	1.742	0.217
	(0.714)	(0.590)	(0.612)***	(0.643)***	(0.537)
Unemployment					
UNRATE	3.000	-2.038	14.85	-9.480	2.227
	(11.58)	(9.604)	(6.530)**	(4.861)*	(3.980)
GRUN	1.015	-0.450	0.239	-0.034	2.247
	(0.792)	(0.670)	(0.196)	(0.411)	(0.575)***
Personal/household wealth					
DWELLING	-5.096	-1.895	-4.690	-5.110	-2.932
	(2.434)**	(2.120)	(2.005)**	(2.098)**	(1.664)*
Constant	11.43	7.192	8.279	9.567	5.766
	(2.412)***	(2.142)***	(2.116)***	(2.305)***	(1.782)***
Number of regions	88	88	88	88	88
R^2, %	41	36	30	37	49
Adjusted R^2, %	34	29	22	29	43
F(9,78)	5.90***	4.91***	3.75***	5.00***	8.17***
Diagnostic tests					
Normality, $\chi^2(2)$	5.18*	12.53***	12.94***	25.54***	39.07***
Reset, F(3,75)	1.25	1.26	3.68**	2.57*	2.45*
Heteroscedasticity, $\chi^2(1)$	1.44	4.13**	0.01	0.40	0.00

Notes: *** denotes significance at the 0.01 level
** denotes significance at the 0.05 level
* denotes significance at the 0.10 level

Table A5. Regional factors and firm foundation per establishment: cross-sectional results for the years 1989-1993.

	1989 Coef. (std.err.)	1990 Coef. (std.err.)	1991 Coef. (std.err.)	1992 Coef. (std.err.)	1993 Coef. (std.err.)
Demand growth					
GRGRP	2.442	1.802	1.630	-9.475	-2.495
	(3.127)	(3.299)	(4.312)	(4.201)**	(3.169)
GRPOP	63.51	99.77	93.67	4.223	-79.45
	(28.96)**	(29.76)***	(25.77)***	(3.323)	(133.51)
Urbanization/Agglomeration					
POPDEN	7.03	6.303	-2.617	7.343	9.120
	(4.50)	(4.483)	(5.032)	(4.346)*	(3.886)**
Small firms					
ESIZE	-0.186	0.035	0.292	0.244	0.221
	(0.114)	(0.120)	(0.120)**	(0.156)	(0.128)*
Government spending					
LOCEXP	2.945	1.709	-3.971	5.467	0.895
	(1.897)	(1.712)	(1.720)**	(2.035)***	(1.952)
Political ethos					
SOCIALIST	0.033	0.031	-0.050	-0.196	-0.033
	(0.138)	(0.119)	(1.026)	(0.116)*	(0.117)
Unemployment					
UNRATE	23.90	7.958	59.07	-1.872	32.93
	(30.76)	(27.88)	(18.35)***	(15.37)	(14.47)**
GRUN	0.445	0.043	-0.031	5.665	
	(2.104)	(1.945)	0.867	(1.298)	(2.089)***
			(0.551)		
Personal/household wealth					
DWELLING	-0.347	10.69	1.899	-3.619	1.547
	(6.469)	(6.154)*	(5.634)	(6.633)	(6.048)
Constant	14.29	1.159	4.934	12.93	3.722
	(6.422)**	(6.218)	(5.948)	(7.289)	(6.476)
Number of regions	88	88	88	88	88
R^2, %	15	20	28	29	31
Adjusted R^2, %	5	11	19	21	23
F(9, 78)	1.52	2.23**	3.33***	3.51***	3.94***
Diagnostic tests					
Normality, $\chi^2(2)$	8.10**	4.01	0.04	6.13**	29.15***
Reset, F(3,75)	0.41	5.68***	0.46	1.01	0.56
Heteroscedasticity, $\chi^2(1)$	2.98*	8.70***	9.95***	3.86**	0.00

Notes: *** denotes significance at the 0.01 level
** denotes significance at the 0.05 level
* denotes significance at the 0.10 level